

	<h2>Advisory Committee on Commercial Remote Sensing (ACCRES)</h2> <p>Tuesday–Wednesday, October 27–28, 2020, 10:00 AM–2:00 PM Cisco WebEx</p>		
	<h3>Meeting Attendees</h3> <p>Committee</p> <ul style="list-style-type: none"> • Mr. Gil Klinger (Chair), President, Gil Klinger Consulting • Mr. Payam Banazadeh, CEO & Founder, Capella Space • Mr. John Bellardo, Professor of Engineering, California Polytechnic State University • Mr. Gregory Black, Deputy Director, Office of Ventures and Innovation • National Geospatial-Intelligence Agency • Ms. Patricia Cooper, Vice President of Satellite Government Affairs, Space Exploration Corporation • Mr. David Germroth, Vice President, Defense and Intelligence Programs, Airbus U.S. Space and Defense • Mr. Todd Harrison, Director for Defense Budget Analysis and Senior Fellow, Center for Strategic and International Studies • Dr. Henry Hertzfeld, Director, Space Policy Institute, George Washington University • Mr. Adil Jafry, President & CEO, Chandah Space Technologies • Dr. Bhavya Lal, Research Staff Member, Institute for Defense Analyses • Mr. David Langan, CEO, Umbra Lab, Inc. • Mr. Tony Lin, Partner, Hogan Lovells • Ms. Anne Migalrese, CEO, Radiant Earth • Dr. Jamie Morin, Vice President of Defense Systems Operations, The Aerospace Corporation • Mr. Kevin Pomfret, Founder, Centre for Spatial Law • Mr. Robert Schingler, Jr., Co-Founder and Chief Strategy Officer, Planet Labs • Dr. Brian Weeden, Director of Program Planning, Secure World Foundation <p>Speakers</p> <ul style="list-style-type: none"> • Kara Cunzeman, Lead Futurist, Center for Space Policy and Strategy, The Aerospace Corporation • Blaine Curcio, Euroconsult • Carissa Christensen, Bryce • Karl Kensinger, U.S. Federal Communications Commission <p>Department of Commerce/National Oceanic and Atmospheric Administration</p> <ul style="list-style-type: none"> • Mr. Mark Paese, Deputy Assistant Administrator for Satellite and Information Services, NOAA • Mr. Kevin O'Connell, Director, Office of Space Commerce, NOAA • Ms. Tahara Dawkins, Director, Commercial Remote Sensing Regulatory Affairs and Committee Designated Federal Official, NOAA 		
<h2>Meeting Minutes</h2>			
<p>Day 1 10:00 EDT, Tuesday, 27 October, 2020</p>			
<table> <tr> <td data-bbox="68 1640 812 1806"> <p><u>ACCRES Welcome & Introduction of Speakers</u></p> <ul style="list-style-type: none"> • Ms. Dawkins, Director, Commercial Remote Sensing Regulatory Affairs (CRSRA), welcomed participants to the 28th Meeting of the Advisory Committee on Commercial Remote Sensing (hereinafter, “the Committee”) </td><td data-bbox="812 1640 1557 1806"> <p><u>Tahara Dawkins, Gil Klinger, Mark Paese</u></p> </td></tr> </table>		<p><u>ACCRES Welcome & Introduction of Speakers</u></p> <ul style="list-style-type: none"> • Ms. Dawkins, Director, Commercial Remote Sensing Regulatory Affairs (CRSRA), welcomed participants to the 28th Meeting of the Advisory Committee on Commercial Remote Sensing (hereinafter, “the Committee”) 	<p><u>Tahara Dawkins, Gil Klinger, Mark Paese</u></p>
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and turned the floor over to Mark Paese, Deputy Assistant Administrator for Satellite and Information Services (NESDIS), National Oceanic and Atmospheric Administration (NOAA).

- Mr. Paese welcomed the participants on behalf of Dr. Neil Jacobs, Administrator, NOAA, and thanked those committee members soon to rotate off the Committee for their contributions. He highlighted the successful transition to the new regulations as CRSRA's foremost accomplishment since the last meeting, although he noted that there remains plenty of work to be done to ensure the regulations are implemented in such a way that enhances United States (U.S.) competitiveness.
- Mr. Paese then laid out the meeting's agenda, including:
 - updates on the state of the satellite industry in the U.S. and abroad,
 - updates from CRSRA on the implementation of the final rule, and
 - a progress report from each of the task groups—Regulation Implementation, Data Availability, Synthetic Aperture Radar (SAR), and Futures—established at the June meeting.
- Mr. Paese then turned the meeting over to the Committee chair, Mr. Gil Klinger. Mr. Klinger greeted the members of the Committee and of the public, thanked them for their attendance, and conducted a roll call for the Committee.
- Mr. Klinger highlighted the purpose of the working group briefings on the meeting's second day, stating that, while he did not expect any of the questions they have posed to be answered during the course of the meeting, the expectation and aspiration is for each of the groups to leave the meeting with "more than one and less than four" topics for each working group to address in greater detail. The groups should walk away from the meeting knowing the specific "homework" needed to bring back information to the Committee.
- Mr. Klinger noted that, as quickly as things were changing during the June meeting, that rate of change continues to increase. Mr. Klinger concluded by noting that November's election, regardless of outcome, will impart energy into the system while possibly suspending other activities, however, the Committee exists outside of the body of politics and is well-suited to address continuing issues despite transitions experienced by the government sponsor.
- Mr. Klinger turned the meeting back to Ms. Dawkins.

U.S. Perspective of the Satellite Industry (presentation attached)

Kara Cunzeman

- Ms. Dawkins introduced Kara Cunzeman, Lead Futurist for Strategic Foresight, Center for Space Policy and Strategy, The Aerospace Corporation. Ms. Cunzeman is an expert in methodologies for futures thinking and assists the Aerospace Corporation in adequately preparing for and proactively shaping the future through strategy, acquisition, portfolio management, policy, and operations.
- Ms. Cunzeman began by thanking the Committee for the invitation. Ms. Cunzeman was asked to provide perspective and consideration on what might be beyond the horizon for the U.S. space market. To address this topic, Ms. Cunzman's briefing would cover:
 - U.S. venture capital (VC) market analysis,
 - economic levers, and
 - strategic foresight.
- The National Association of Securities Dealers Automated Quotations exchange (NASDAQ) remains at all-time high, and near to a 5-year high, for technology company valuations despite depression-era levels of unemployment.
 - At a macro level, Ms. Cunzeman noted, the technology sector has been given a big boost because of the increased need for technology during the coronavirus disease 2019 (COVID-19) pandemic.
 - High stock prices encourage mergers and acquisitions, which can cause instability in the supplier base.
 - High stock prices and significant valuation also encourage venture capitalists to increase investment and take investments public.
 - VC funding has passed the 2000 dot-com bubble funding levels.
 - In sum, there are multiple indicators that the market may be in the tail-end of a public market cycle.

- Noting that the U.S. market is showing indications of the end of a market cycle, and that the U.S. Government (USG) is interested in promoting the growth and sustainability of the commercial remote sensing (specifically, geospatial intelligence) market, Ms. Cunzeman reviewed a 2017 Aerospace Corporation study that identified and examined economic lever options available to the USG to enhance market growth.
 - Ms. Cunzman began by describing four economic barriers that emerging and established commercial satellite imagery providers face:
 - inadequate revenues,
 - high operational costs,
 - high cost of capital, and
 - high capital expenditure.
 - Under the caveat that the study was intended to be a preliminary overview, Ms. Cunzman stated that the study team identified 35 potential economic levers available to the USG. These fell under the following categories:
 - revenue enhancement,
 - direct financial assistance,
 - indirect financial assistance,
 - public-private partnerships, and
 - policy and regulatory change.
 - The study team compared the relative effectiveness of each economic lever on each economic barrier, qualitatively describing the impact of the lever as “major,” “substantial,” “moderate,” or “negligible.”
- Ms. Cunzeman stated that levers aren’t effective if there’s no clear or specific desired outcome. The desired outcome can be developed using the principles of foresight.
 - In today’s increasingly complex environment, standard approaches for prediction produce diminishing returns.
 - Foresight is a valuable instrument for looking ahead to critical decision points.
 - Foresight is a systematic method for investigating possibilities for the future.
 - Foresight is not prediction; it is preparedness and management of the uncertain.
 - Foresight allows organizations to stay ahead of change.
 - The foresight cycle involves horizon scanning to expand awareness, harnessing critical insights, and taking action to drive meaningful outcomes.
- Alluding to recent collaborations with the U.S. Air Force Warfighting Integration Center, Ms. Cunzeman detailed the result of USG foresight activities for space. These have emphasized that COVID-19 pandemic has highlighted the brittle space supply chain, fragility in the commercial market, the desire of adversaries to leverage disruption to their advantage, and, foremost, a greater need for clarity in the national vision for space and national objectives in balancing commercial space activities with civil and national security activities. Ms. Cunzman noted that it is essential to move from reactive to proactive measures, for example, in encouraging emerging business models and markets (e.g., SAR) that the government wants.
- Ms. Cunzeman concluded by summarizing that USG is able to gain critical insights from the current commercial space market, to employ strategic foresight to outline the desired result, and to leverage its economic power to shape the future it wants.
- Ms. Dawkins opened the floor to questions from the Committee
- Mr. Kevin Pomfret, member of the Committee, asked what impact federal procurement laws have on sales of imagery data to the government and the government acquiring data rights. Ms. Cunzeman responded that the study was not sufficiently in-depth to answer those questions, and that it looked at regulations as a lever, but did not look at recent changes. This would be an example of a deep-dive that could be done, however.
- Mr. Klinger noted that USG is effectively unable to use revenue enhancement and direct financial assistance—two of the economic levers mentioned in the briefing—as DOD cannot use them easily, Congress would not fund them for a long enough term, and emerging space companies will not receive a long-term contract from, for example, the National Geospatial-Intelligence Agency (NGA). As a result, these significant

levers generally are not available to create a positive impact on nascent industries. In contrast, every other space faring country, including peer competitors, actively underwrite their space industries to varying degrees. This is an extreme disadvantage to U.S. companies.

- Mr. Klinger then asked if the economic lever study had been reviewed by any members of industry to see what their reaction would be to, for example, the appraisal of the impact of different levers? Ms. Cunzeman agreed with Mr. Klinger's points and stated that the study had not been reviewed by industry, but that such a review would be a valuable exercise.
- Dr. Jamie Morin, member of the Committee, suggested that it was important to distinguish revenue enhancement from direct financial assistance and that Mr. Klinger's description of the unavailability of revenue enhancement and direct financial assistance was an overgeneralization because any government purchase of a service has impact in terms of revenue enhancement. He agreed that industry would often prefer longer-term contracts that are not generally available from government, Dr. Morin noted that the government does sign substantial contracts with mid-tier players in the commercial arena. Dr. Morin also noted that there is ongoing significant effort on the part of USG to be more deliberate and more effective in engaging nascent industry as part of new, hybrid architecture, which may lead to more use of the direct financial assistance lever.
 - Mr. Klinger concurred but noted that the success of nontraditional acquisition can't be evaluated until there has been a large acquisition in that mode. Furthermore, there are times and places where the infusion of capital is a make-or-break. For example, awarding a contract to a company for a sample of their imagery after U.S. policy permitting the commercial sale of imagery has been in place for 20 years is a largely meaningless and insubstantial action in terms of USG support to U.S. industry. Time is a luxury the industry and USG do not have because peer competitors are at equivalence, and in some cases, peer competitors are selling products and services superior to those offered by U.S. providers (for example, SAR).
 - Dr. Morin agreed that USG has been restrained in direct financial assistance because right now, there is not a major problem with access to private capital.
- Mr. Robbie Schingler, member of the Committee, noted that the information presented is fundamental and that the commercial remote sensing sector is going through a transition. Mr. Schingler voiced the belief that, as one of the fastest growing portions of the space sector, there should be an integrated industrial policy on commercial remote sensing. This is about the role that the government plays in market shaping. It requires foresight for the government to create programs that stimulate and catalyse the growth of the industry we seek. Revenue derived from USG levers listed on the far left of Ms. Cunzeman's charts and applied to long-term contracts or one-off projects is very different than the same revenue used to buy a commercial subscription to sell to many people globally. If those product companies are built with a deep tech supply chain that includes U.S. aerospace industry, there is incentive for direct investment by the companies into upgrading its service and adding differentiation in the global market. The point is that there are different types of contracts that the government can use when buying an operational service which will stimulate the dynamics in the industry supply chain. Do we want enhanced competition? Enhanced collaboration? Is there massive innovation occurring? There should be an integrated investor policy.
- Ms. Dawkins closed the questioning.

State of the Chinese Market (presentation attached)

Blaine Curcio

- Ms. Dawkins introduced Mr. Blaine Curcio, Senior Affiliate and Consultant, Euroconsult. Mr. Curcio is Euroconsult's consultant focusing on the Chinese space sector.
- Mr. Curcio introduced himself by saying that he is a macro-economic market analyst with deeper understanding of China's commercial remote sensing (CRS) industry and the briefing covers the commercial earth observation sector in China. Agenda included:
 - an introduction to Euroconsult,
 - the meaning of "commercial" in the Chinese context,

- o an overview of Chinese CRS industry and national-level strategy,
 - o discussion of specific CRS players and market trends, and
 - o conclusions.
- Mr. Curcio founded Orbital Gateway Consulting and has worked with a variety of USG clients as well as Euroconsult, the global leader in space and satellite industry. Mr. Curcio is the author of the China Space Industry Report.
- Mr. Curcio then addressed the meaning of “commercial” in China.
 - o The “national team,” which is commonly used to refer to traditional state-owned enterprises (SOE), are primarily tasked with developing the industrial base, the space industry, creating jobs, etc. These are funded primarily by the central government, and their customers are primarily governmental.
 - o Commercial companies have the primary mandate to make money, although there may also be elements of developing certain technologies for sale to SOEs. Commercial companies are funded by diverse sources including private venture capitalists, SOEs, or provincial or city governments. Their customers are similarly some combination of provincial or local governments, SOEs, commercial companies, research institutes, and universities.
- Over the last decade, there has been an acceleration of China’s Earth Observation (EO) program.
 - o The EO program started with the China High-resolution Earth Observation System (CHEOS) in 2013 and now includes more commercial companies with satellites on orbit, like Charming Globe.
 - There is a certain amount of openness of data on the civil side; the government makes select data available from the GaoFen constellation.
 - o Recently, China Aerospace Science and Technology Corporation (CASC), China’s largest space SOE, reorganized to give EO a consolidated program and its own academy so that EO would have more autonomy.
 - o The overwhelming majority of the EO sector as measured by number of satellites and mass launched is still represented by SOEs.
 - o In spite of increased commercialization, EO aligns with several high-level Chinese government issues, such as the Belt and Road Information Corridor (Digital Silk Road) and interest in integrating EO, satellite navigation, and satellite communications into one system.
 - The success of Starlink’s large number of satellites (launched in short period) as well as the Starlink agreement with the U.S. military have sparked China’s interest.
- The distinction between SOEs and commercial space companies began to appear in 2014. Prior to that there was no commercial space sector in China.
 - o Since 2014, about 140 space companies have cropped up. About 30 of these are in Earth Observation, while more are focused on down-stream analytics or value-added services (VAS).
 - o As of July, 2020, 44 satellites have been launched by commercial companies.
 - o The price for EO data 7-15\$/km².
 - o There is more expansion and commercialization of the downstream value chain but some broadening of the owner/operator base with the production of sophisticated EO satellites.
- Because of China’s uncertain regulatory environment, most of the commercial companies are trying to do multiple things on the value chain, including manufacturing, operating, providing services, and providing applications. They are adept at pivoting between activities when regulatory changes require it.
 - o All but one of the EO commercial companies operate their own satellites.
 - o Several manufacture satellites but do not operate them.
 - o Most of the commercial companies have ties to the state.
- Mr. Curcio illustrated these points by detailing what he considers the most noteworthy commercial EO company in China from a developmental and emblematic perspective: Charming Globe.
 - o Charming Globe was a spinoff from the Chinese Academy of Sciences (CAS), and it is located in part of Chinese Rust Belt where the local government is keen on incentivizing high-value manufacturing jobs. The large CAS Institute for Optics and Fine Mechanics is also in this region.

- o Approximately 1% of the employees have large equity shares in the company.
 - o Charming Globe's first launch was around 2015.
 - o They are now manufacturing dozens of 100+ kilogram satellites/year and operate more than 15 EO satellites.
 - o Charming Globe advertises in ways that an SEO cannot. For example, they partnered with Chinese streaming platform Bilibili to dedicate a channel to all of the video from one of their video satellites. They had over 100,000 subscribers to this channel within a few hours of its airing. They also recorded one of their launches from one of their video satellites—the video went viral even on the Western internet. They are very good at publicity stunts.
 - o Charming Globe has accelerated their roll-out plan. When they first rolled out their constellation plans, they expected 138 satellites by 2030. That date has moved to 2023.
 - o Charming Globe has also built the largest EO research and development center in Asia partnership with the government.
- Big technology companies are becoming involved in the EO market sector.
 - o Alibaba, Huawei, Tencent, and SenseTime have developed EO platform initiatives. These companies are very powerful, and their involvement signals that the market is strong and growing.
 - o Starboard has provided some VC funding, and a couple of space companies have successfully made initial public offerings (IPOs).
- Provincial and local city governments, such as in Jilin and Wuhan, are another piece of supporting infrastructure for EO companies. The industrial ecosystems and platforms are being built by the governments, and then commercial companies are able to develop in these ecosystems.
- Mr. Curcio then projected that moving forward, he expects to see:
 - o internationalization of data distribution, networks, partnerships;
 - o diversification of data sources and solutions;
 - o more big technology involvement as a startup investor;
 - o mass market access and more emphasis on mass market applications; and
 - o reorganized big technology corporation and innovation in more IPOs / mergers.
 - o Big tech companies will be important to that.
- He noted that in China aligning big projects among different stakeholders that have monopolies is challenging. For example, a low-Earth orbit (LRO) broadband constellation like Starlink wouldn't necessarily work because there would have to be two owners—CASC and a telecom company. That makes it a hard proposition to vertically integrate.
- Mr. Curcio concluded that:
 - o China has robust EO infrastructure in place;
 - o the dividing line between commercial and national team not clear;
 - o space is becoming a hot topic for regulators, so there will be an increase in policy support;
 - o Chinese businesses have taken the approach of launch first, develop business later, which is not a great business model and is likely to change; and
 - o given China's glut of EO data, internationalization will become key.
- Ms. Dawkins opened the floor to questions.
- A member of the public asked for information on the article Mr. Curcio mentioned related to China moving to more industrial IOPs. Mr. Curcio responded that the article on the industrial IOP was published by an organization called MacroPolo.
- A member of the public noted that China overbuilt its steel manufacturing capacity and, as a result, flooded the world with cheap steel. The participant asked if Mr. Curcio sees the same thing happening with CRS data. Mr. Curcio responded that, while China has launched many satellites, there is more friction in introducing CRS data and associated applications into the market. This is becoming particularly true as the world becomes more sensitive to China, and it is more difficult for any U.S. company to do significant business with China. That

said, there are areas in which China will be over capacity and have significant incentive to price its data competitively.

- Mr. Adil Jafry, member of the Committee, asked who owns the equity of Charming Globe that is not owned by its employees? Mr. Curcio replied that more than 50% of the equity would be owned by CAS or the Chinese state.
- Mr. David Langan, member of the Committee, asked if Mr. Curcio could speak to the types of sensing modalities receiving investment within China? Mr. Curcio responded that Charming Globe is mainly investing in optical, whereas national constellations like GaoFen and YaoGen are developing in the direction of hyperspectral. He said that there are a couple of SAR sensors, but that doesn't appear to be an area of great advancement.
- Mr. Pomfret asked how Mr. Curcio would suggest best determining what the capabilities Chinese satellite systems on the commercial and state sides have? In general, how does he recommend determining the capabilities and data offerings of foreign satellites and data providers? Mr. Curcio replied that many companies publish that information in Chinese on their websites and that he attends, or has deputies attend, conferences in China to hear presentations from the commercial space companies.
- Mr. Tony Lin, member of the Committee, remarked on how complex and difficult it appeared to be to accumulate this information. He then asked what NOAA does that might be similar to what Mr. Curcio has done, if anyone on the NOAA staff is fluent in Mandarin, and if NOAA could obtain this same information. He noted that the relevance of being able to accurately assess foreign systems for NOAA license tier classification purposes.
 - o Ms. Dawkins replied that NOAA relies on the expertise of others, like The Aerospace Corporation, Euroconsult, the NGA, and everyone who can obtain this information. For example, CRSRA also gets this information from U.S. companies. She noted that a lot of the information in Mr. Curcio's presentation CRSRA has seen before, and it's good to see there were no surprises. Because the market is growing quickly, constantly obtaining (updated) information is a challenge.
 - o Mr. Lin then asked Mr. Curcio if there are other countries similar to China, like Russia or India, that have thriving EO markets that CRSRA should be aware of, and if Euroconsult monitors those? Mr. Curcio responded that Euroconsult has an EO team that publishes an annual, global EO report. He noted that Japan's EO industry is advanced with companies selling data solutions and satellite manufacturing. Euroconsult does have experts in other parts of the globe.
- Mr. Schingler noted that China sees EO as part of a larger strategy that bundles it with machine learning and artificial intelligence as part of their international digitization plan—the Digital Belt and Road Initiative. Going forward, this may distort the global market for EO and result in its under- or over-valuing.
- Ms. Dawkins thanked Mr. Curcio for his presentation.

Comprehensive Report on the State of the Satellite Industry (presentation attached)

Carissa Christensen

- Ms. Dawkins introduced Ms. Carissa Christensen, Chief Executive Officer, Bryce Space and Technology. Prior to founding Bryce, Ms. Christensen co-founded the defense company The Tauri Group, acquired by LMI in 2019, and quantum computing software company QxBranch, acquired by Rigetti Computing in 2019. She is an active investor serving on several early stage boards as well as an internationally-recognized expert on research and development processes, technology forecasting, and the space industry.
- Ms. Christensen introduced her briefing by noting that it is compiled from industry reports available for free from Bryce, a number of which are produced annually using more than 20 years of data.
- Ms. Christensen highlighted that, although the mature satellite industry is seeing flat or slightly declining trends, the global industry is increasing productivity and new capabilities that shape the industry.
 - o Telecommunications satellites are seeing massive increases in available capacity on orbit and significant cost decrease.

- The remote sensing sector has seen a dramatic increase in the number of satellites and an expansion of their capabilities.
 - Launch is becoming more affordable, there is a wider range of launch choices, and capacity per launch is increasing.
- She noted that the composition of on-orbit satellites is changing dramatically, and that with more and more diverse active satellites, traditional ways of enumerating satellites and capturing data about activities on orbit are becoming less relevant. A new approach to evaluating these is needed.
 - The number of active satellites on orbit has increased by 77% over the last 5 yrs.
 - There has been an increase in the proportion of remote sensing satellites.
 - It is projected that next year's analysis will see a significant increase in LEO communications satellites.
- Mr. Christensen said that the global space economy has reached \$366 billion. A breakdown of the space economy elements shows infrastructure elements, which form a pyramid with the satellite industry as the base. The breakdown is helpful in policymaking because it provides framing around the relative size of government vice commercial space activities.
- Ms. Christensen displayed a diagram of the relative sizes of satellites, noting how satellite form-factors have transformed, reflecting the visionary ways they are being used.
 - She highlighted the contrast in size between a global telecommunications satellite and a Planet Dove satellite.
 - She observed that satellites tend to get larger. Although the industry went through a transformation with the incorporation of small satellites launched large constellations, across the industry, the satellites are once again tending to grow in size.
 - For example, cubesats are increasing in unit number.
 - Economics drive toward satellite increasing in size.
 - Interesting contrast with the shared sense that industry has moved to smaller satellites.
 - 899 commercial smallsat were launched between 2012 and 2019
 - 68% of smallsats were for remote sensing.
 - 81% of smallsats were manufactured by the U.S.
 - 70% of smallsats were owned by SpaceX, Planet, and Spire.
 - The composition of smallsats launched is changing again because of LEO telecommunications constellations.
 - On a final note on smallsats, Ms. Christensen pointed out that 2 or 3 years ago, the smallsat conversation was about remote sensing operators. Today, in the same conversation, the remote sensing aspect has almost disappeared.
- Ms. Christensen then focused on the CRS industry. The core customer groups, she said, are USG, international defense and intelligence communities, and commercial industry.
 - The existing USG market is reliable and attractive. Intelligence and military users now cannot accomplish mission goals without remote sensing, and they are driving the market toward increasing analytics.
 - International defense and intelligence communities, although not as large as the USG market, represent a growing market and are rapidly incorporating remote sensing into decision making processes.
 - There is wide interest in the commercial applications of remote sensing across a variety of sectors. Satellite remote sensing operators are growing at scale by helping potential users incorporate this new kind of insight into their decision-making processes. There's an institutional transformation occurring, and it focused on the transition from imagery to analytics.
- Ms. Christensen concluded by reviewing revenue in the remote sensing sector.
 - Revenue has doubled over the last decade.

- o The potential that has attracted investments is associated with incorporating data analytics and new types of imagery.
- o There is anticipation of continued market growth.
- o Total venture investment in EO and related analytics is approaching \$20 billion, and investment by satellite operators about 50% of that. Part of that is a disproportionate amount of investment in launch driven by super angels.
- Ms. Dawkins opened the floor to questions from the Committee.
- Mr. Klinger made several remarks in response to the briefing.
 - o With respect to electro-optical imagery, there are few “killer apps” remaining. This is very different than for SAR, for which VAS capabilities are barely developed, and hyperspectral and video capabilities, which are in the emergent stage. It’s vital to ask where the next big thing is coming from, and the perspective of that is shaped by the evolution of institutional customer behavior around envisioning capabilities.
 - o Mr. Schingler noted that it seems like future trends in government lead toward digitization and the need for new workflows, as they have in the CRS sector.
 - o Ms. Christensen concurred and noted there is anticipated rapid growth of the analytics market. Digital transformation and incorporation of advanced analytics is now happening so fast that in some cases satellite companies are driving that change and breaking ground by bringing their unique satellite imagery value-add to analytic capabilities.
- A member of the public asked if Bryce conducts analyses at a country level to see how the U.S. market has changed for remote sensing data as compared to the global market. Ms. Christensen responded that their analyses take various perspectives but the annual survey doesn’t break out U.S. and non-U.S. remote sensing data sectors.
- Ms. Dawkins opened the floor to audience questions and comments on the morning’s briefings.
- Mr. Tony Frasier, member of the public, commented that, after seeing the earlier presentations, there’s a great opportunity to look at how, as a near-peer, China is using economic levers to support industry as opposed to how the U.S. does.
- A member of the public pointed out that USG has used tariffs to counter foreign government subsidies on foreign companies selling to the U.S. The member of the public asked if this constitutes a lever or a risk? Ms. Cunzeman responded that the answer goes back to having an intensive look at the options and what the secondary and tertiary impacts of decisions are in addition to the direct, reactionary policies. Tariffs are an example of a potential lever.
- Mr. Klinger reviewed the foci of the morning’s briefing, which were on a) broader remote sensing trends, and b) the underlying nature of the relationship between USG and remote sensing or China and remote sensing.

FCC New regulations relationship to the remote sensing industry (presentation attached)

Karl Kensinger

- Ms. Dawkins introduced Karl Kensinger, Acting Chief, Satellite Policy Branch, U.S. Federal Communications Commission (FCC), who has experience working on a broad range of satellite policy and licensing matters, including radio spectrum policy and transfers of FCC licenses.
- Mr. Kensinger reviewed the history of the FCC orbital debris rule.
 - o The rule was last adopted in 2004. The 2004 rule addressed collision risk, accidental explosion risk, and end-of-life disposal (including the “25-year requirement”). At the time the rule was adopted, it was in keeping with USG practices. The 2004 rule allowed the commission to require modification of the plan or deny the license based on orbital debris plan and applied to all non-Federal satellites.
 - o In *circa* 2013, the FCC began to reevaluate the orbital debris rule due to the proliferation of smallsats, which were then proposed for large telecommunications constellations. Smallsats presented issues that hadn’t been routinely considered previously, many of which led to the realization that an update to the rule was needed.

- o The FCC issued a 2020 update to the orbital debris rule. The update incorporates new assessment methods and criteria, codifies licensing practices, and examines suitability of new criteria for large constellations.
 - o A Report and Order and Further Notice of Proposed Rule Making was released in April, 2020.
- Mr. Kensinger detailed changes made in the revisions to the Commission's rules as adopted in the April, 2020 Report and Order. The new rule:
 - o adds numerical criteria to existing requirements, including the collision risk per satellite and casualty risk assessments;
 - o requires applicants to certify that upon receipt of a conjunction warning, the operator will review and take possible steps to assess and mitigate the collision risk;
 - o requires application to include statements with respect to protecting habitable spacecraft, maneuverability, identification, and information sharing for space situational awareness; and
 - o adopted disclosures regarding activities like proximity operations.
- Mr. Kensinger reported that the status of the rule updates are as follows:
 - o Two rule updates regarding coordination of orbit raising maneuvers and clarification on control of transmitting stations became effective September, 2020.
 - o Other updates will take effect later.
 - o Three petitions for reconsideration were filed in September, 2020.
 - o Comments have been solicited on further rule changes, such as orbital debris mitigation measures and approaches of addressing collision risk.
 - o Approximately 40 comments have been filed as of the October, 2020 deadline, and the FCC has until November, 2020 to reply.
- Mr. Kensinger noted that, recognizing NOAA authority with respect to remote sensing spacecraft, the FCC rules have included a relevant provision that applicants with Earth remote sensing satellites may submit post-mission disposal plans to NOAA, and that FCC has retained the orbital debris mitigation regulation.
- Ms. Dawkins opened the floor to questions from the Committee
- Mr. Lin asked about the FCC's relationship with agencies other than NOAA, for example, the FAA, and if the FCC rules synthesize well with the new FAA rules. Mr. Kensinger replied that he had not reviewed the FAA rule but that he believes there is a good working relationship with colleagues at the FAA.
- A member of the audience asked if there are efforts to synchronize NOAA and FCC regulations regarding space debris. Mr. Kensinger responded that he believes so, and that they are working to eliminate duplication. Their efforts are focused on a whole-of-government process.

Committee Discussion & Public Comments

- Ms. Dawkins and Mr. Klinger opened the discussion by reviewing that the speakers covered the global and U.S. perspectives of present and future market trends and offerings. They asked if there were any Committee comments based upon the briefings and what the Committee members' overall impressions were.
- Mr. Lin voiced the belief that, listening to the report on China, he believed it would take more than browsing websites and public observation to understand availability from foreign companies. In the context of tiering licenses fairly, companies rely upon NOAA to make accurate determinations. Mr. Lin questioned whether this could be done without expertise and connections in each country.
- Henry Hertzfeld, member of the Committee, wondered about market development and data availability in countries such as India and Russia, which are countries with the potential for a lot of capabilities. In those countries, the government and industry relationships are different than those in China and the U.S. He questioned if NOAA can keep up with change in the market when making license decisions.
 - o Mr. Kingler noted that the rate of change in the market threatens to exceed government's ability to keep up, and that this could be a concern if licensing decisions are tied to what is perceived as available. He posed the question of how you think about this licensing regime not just in terms of economic activity

in the world, but economic activity that is authored by countries without benign intent in a lot of what they are doing, whether it's toward the U.S. or other countries in their region in which they are interested.

- Mr. Brooks Cressman, support to CRSRA, stated that NOAA has a number of ways of obtaining information. He noted that he appreciated the Euroconsult briefing and reiterated Ms. Dawkins' remarks that there were no surprises, and that CRSRA is aware of the companies, their constellations, and the data that were presented. He explained that CRSRA's issues revolve more around more technical problems, such as data availability and separating publicly-available data from restricted data originated from dual-use systems—how does CRSRA find that dividing line?
 - Dr. Sarah Brothers, support to CRSRA, agreed with Mr. Cressman, saying that CRSRA uses many of the same outlets Mr. Curcio had mentioned. With regards to some concerns she had heard expressed by members of the Committee that NOAA would be deluged with a volume of information that the staff could not handle, she stated that, although NOAA has invited company inputs, it has received very few from companies—this fear hasn't been realized. Furthermore, NOAA has yet to receive any data leads of which the CRSRA staff were not already aware. She concluded by inviting companies to submit their data availability leads through the portal on CRSRA's website.
- Mr. Klinger encouraged companies to submit data availability leads because private sector companies have at their disposal agility and resources in terms of competitive intelligence that the USG—even if it had—has higher priorities in the allocation of resources that preclude allocating resources toward that end. To the extent any company is aware of information, he recommended that the company assume USG doesn't have that same situational awareness.
- Mr. Pomfret added that the issue on where information comes from needs to continue to be discussed. Additionally, earlier discussions about economic levers for supporting the market are valuable. One of the challenges for the Committee, he suggested, is not just evaluating the present market, but what the market will be years from now and the governance around that market. Finally, he questioned how the Committee can help NOAA to develop processes and procedures that will give industry the sense that NOAA is current.
- Mr. Klinger asked Mr. David Germroth, a member of the Committee, what he has observed with respect to SAR. Mr. Germroth replied that there is lots going on with the international community. When it comes to many commercial capabilities, there's no part of the industry that doesn't have government funding. As in China companies are doing things that seem not so interesting now, but they are growing and advancing in capability, and they receive government help because some nations believe financing this market segment is national security. He added that the NOAA team could maybe use more staff because of how much is happening in this sector.
- Mr. Klinger commented that there is a tendency to view the CRS industry and licensing as something of a niche with limited implications. This is an industry, however, developing tools that can—in the wrong hands—be used to fundamentally change how nations and people look at the world. The stakes couldn't be higher, and although at the day-to-day level, it doesn't look like there's a problem, looking 4 years ahead things will have shifted. There's no way to tell if that shift will be beneficial to the U.S. or not.
 - A member of the Committee suggested that a discussion with members of the DOD or Intelligence Community might be beneficial. Mr. Klinger agreed but noted that ACCRES meetings must be held in public, and that part of its job is to make known to the public what is on the Committee's mind with respect to issues for which the Committee is advising NOAA.
- Ms. Dawkins opened the floor to questions from the audience. There were no questions.

Closing Remarks

Gil Klinger

- Ms. Dawkins reviewed the agenda for the second day of the meeting, to include a briefing from CRSRA on the implementation of the new regulations and a briefing from each task group, and adjourned the meeting.

<u>Meeting Adjourned, 2:06 pm EDT</u>	<u>Tahara Dawkins</u>
Day 2 10:00 am EDT, Wednesday, 28 October, 2020	
<u>Welcome & Day 1 Recap</u>	<u>Gil Klinger</u>
<ul style="list-style-type: none">Ms. Dawkins opened the meeting by welcoming participants and turned the meeting over to Mr. Klinger, who greeted the audience and committee. He reviewed the prior day’s briefs, which included discussions on the relationship between the USG and the CRS industry, the state of the Chinese space market, and the state of the global space industry.	
<u>Space Commerce Update</u>	<u>Kevin O’Connell</u>
<ul style="list-style-type: none">Ms. Dawkins introduced Mr. Kevin O’Connell, Director, Office of Space Commerce (OSC), who would be giving a brief overview of the national space policy context and of OSC’s activities.As an aside, Mr. O’Connell addressed comments made during the prior day’s meeting concerning sources of information about data availability and how NOAA keeps current with global developments. He noted that this was a question raised during the interagency rule-making process and that NOAA has access to all of the information that the USG has access to. At the same time, industry has different information, for example, about what competitors are doing related to availability.Mr. O’Connell stated that the Secretary of Commerce continues to advocate for the new regulation and is particularly supportive of its increased transparency and the importance it places in USG engagement with industry, which is in line with direction provided in Space Policy Directive-2 (SPD-2).Mr. O’Connell then enumerated several activities currently being undertaken by OSC.<ul style="list-style-type: none">Dual-regulation (regulation by two States as the result of international business activities) is a growing concern, and as a result, OSC has begun to revisit discussions about space regulation writ large. SPD-2 encourages regulatory modernization, but this has to be done in the international context in which countries are regulating industries in different ways as well as regulating new activities.OSC is investigating a broader set of economic instruments available to assist industry.OSC continues to work on the space traffic management and space situational awareness functions.The recent release of Space Policy Directive-5 (SPD-5), which deals with cybersecurity, has increased the office’s focus on that topic.Mr. O’Connell concluded that he is delighted that there is a strong emphasis in current review of the national space policy on need for a robust, vibrant, forward-looking commercial space sector, and that that view has not only come from the Department of Commerce in the drafting of the updated policy.Mr. Klinger commented that whatever the outcome of the November election, a rewrite of the National Security Presidential Directive-27 is important. Given the rapid changes in the remote sensing environment, there is now a situation in which policy is being made based on individual licensing decisions, and that’s not productive moving forward.<ul style="list-style-type: none">Mr. O’Connell responded that much of those concerns are being thought about in the current national space policy review. We are entering a world in which industry is bringing forward wholly new activities that the government has not thought about, and a new regulatory regime required.Mr. Klinger replied that the national space policy should guide <i>relationships</i> between government and industry.Mr. O’Connell believed that there is improvement with evidence that the government is being more flexible.	

- Mr. Adil Jaffry, member of the Committee, asked Mr. O'Connell if there have been any new activities regarding non-Earth imaging (NEI), particularly with respect to the new rules. Mr. O'Connell responded that NEI has to be thought about in a security context. DOD is concerned about NEI for legitimate security reasons. In commerce, however, NEI is an enabler to inspection, refueling, repair, and all the new activities on the horizon that are needed in the process of changing the economics of space. The new rule takes an action to look at the NEI question in less than 2 years because the rule acknowledges that the market will change, and the regulations will have to adjust quickly given the economic potential of NEI activities.

CRSRA Update (presentation attached)

Tahara Dawkins

- Ms. Dawkins began by providing a high-level update of CRSRA's in-office actions since July, 2020.
 - 29 initial contact forms have been received, 10 of which required a license and 19 of which did not. Of the 19 forms that did not require a license, 10 forms would have required a license under the previous regulations.
 - CRSRA has issued 6 new licenses.
 - The average licensing processing time continues to decrease. Average processing time has been 43 days for calendar year 2020, down from 65 days in calendar year 2019. Ms. Anje Hall, CRSRA staff, noted that the average license processing time under the new regulations has been approximately 25 days.
 - CRSRA is currently processing 3 applications.
 - Of CRSRA's licenses, 56 are Tier 1, 3 are Tier 2, and 16 are Tier 3 (as of 10/23).
- Ms. Dawkins also reviewed the final regulation post-publication timeline, which included notable events such as the 1st annual compliance certification of the new licenses, the completion of tiering for all existing licenses, the roll-out of revised Kyl-Bingaman resolution, and the resolution of 18 license tier contestations, which were resolved at the Secretary level (i.e, between the Secretary of Commerce and Secretary of Defense). Notably, of the 18 disputed licenses, 17 licenses retained the lower CRSRA-determined tier, and only one license received a higher tier.
- Ms. Dawkins then reviewed several frequently asked questions that CRSRA has received since the implementation of new regulations as well as the difference between a waiver, a modification, and an appeal.
 - Waiver: can be requested to waive a condition during the application process.
 - Modification: a request to change a material fact or condition in a license after license issuance.
 - Appeal: contests a determination in the license and must be made within 21 days after issuance of the license.
- Ms. Dawkins stated that there had been some confusion in this year's annual compliance certification. Companies were asking for extensions. Ms. Dawkins explained that the annual certification date is a material fact in the license now and so companies must ask for a license modification in order for it to be changed. CRSRA is permitted 60 days to process license modification requests, so the company would need to submit the request by the 15th of August prior to the October 15th deadline. To extend the date on which the annual compliance certifications are due is no longer something a company can just ask because they want it. This year CRSRA permitted extensions because of confusion around the new process, but Ms. Dawkins stated that CRSRA will be less likely to do so next year.
- Ms. Dawkins then reviewed changes to the tiering benchmarks that have been made since the June, 2020 meeting. She began by saying that the internal updates are immediate, although the website updates are quarterly, the next one being in December, 2020. Changes had been made to:
 - SAR persistence,
 - panchromatic (PAN) imagery persistence,
 - multispectral (MSI) resolution, and
 - hyperspectral (NSI) spatial resolution, with the resolution decreasing from 10 m to 5 m.
- Ms. Dawkins also highlighted that the new Airbus system (Pleiades-Neo) is launching as early as 1st quarter, 2021. In the prior day's meeting, there was confusion concerning how CRSRA will change a

licensee's tier in response to market changes. Ms. Dawkins used the Pleiades-Neo launch as an example. CRSRA knows this is happening and may change the tier of licensees, she said. Once the launch happens, CRSRA will go to the interagency and bring this fact to them. CRSRA will point out what changes it will create in the market, which licensees are effected, and notify the interagency that once the satellite is operational and CRSRA can prove data availability, the affected licenses will change. This process will allow the government time to be ready and draft the revised licenses. As soon as those data are available, the tier change will be instant. That's just one example.

- Mr. Lin commended CRSRA on providing the tiering benchmarks, and he stated that he believes transparency has improved under the new regulations. In terms of transparency, however, he noted that there is some ambiguity in the rule, and there are certain questions that industry would like firm answers about. He asked if there was some way to answer these questions in an accessible format rather than relying on meeting minutes, institutional knowledge, or repeat questioning.
 - Ms. Dawkins replied that the frequently asked questions will be posted on the website along with their answers, provided CRSRA's legal counsel clears them.
 - Mr. Lin requested examples of mission assurance to be posted on the website.
 - Ms. Kate Abbott, Office of the General Counsel, NOAA, noted that the Office of the General Counsel has been providing guidance to CRSRA on how to provide written clarification of the rule's interpretation. The office is thinking actively about how to do this, and the answer could be to post interpretation on the website or to publish notices in the Federal Register.
- Before concluding, Ms. Dawkins addressed concerns by some licensees that the conditions in their licenses had not been streamlined or even seemed to change. This has been, Ms. Dawkins said, one of the biggest complaints CRSRA has received. There are 15 Tier 3 licenses. The intent of the new regulations is to have a lighter touch regulatory regime, and the government has been working tirelessly to streamline those conditions. The government is now nearing the end of that effort and has significantly paired down the restrictions in those Tier 3 licenses. After resolving just a few remaining issues, CRSRA will call each Tier 3 licensee and discuss the changes with them. The Tier 3 licensees will each be given the opportunity to request to modify their license conditions to the new, streamlined restrictions. The licensees will not have to do this.
- Ms. Dawkins then opened the floor to questions from the public.
- A member of the public asked if Mr. O'Connell could expand on his concerns around dual regulation. Mr. O'Connell responded that as more companies enter the market, OSC wants to make sure that the different regulations they confront from multiple countries are not additive. OSC is talking with allies, primarily, about ensuring that companies do not have multi-country regulations that conflict or add administrative burden.
- Mr. Klinger emphasized the need for USG to be adaptable and change. He applauded NOAA for the overhaul of the current regulation, but he highlighted that the industry is changing rapidly and questioned if the standard metrics that USG has been using are still the most relevant ones, given the development of hyperspectral imagery, SAR, and video.

Implementation Task Group Report Out

Kevin Pomfret

- Mr. Pomfret stated that the Implementation task group has not yet moved into the substance, but has concurred on a number of items that need consideration, including:
 - clear and transparent guidelines on how tiers are established and licensees move between tiers;
 - clarification of the line between enhanced and unenhanced data;
 - aligning conflict between U.S. and foreign operators in determining tier placement;
 - developing metrics for determining tiers for NEI; and
 - future collaboration with the Land Advisory Group (LAG).
- The working group had discussed several topics going into this meeting.

- o Ensuring market data is current and market discovery. One idea the group had was that NOAA could automatically check the market a certain amount of time before launch to make a tier adjustment before the system goes on orbit, if needed.
 - o This difficulty of designating tiers for NEI. Sales of products or services is much different than imagery. Key variables in this topic are mission assurance and the definition of primary mission.
- Mr. Pomfret then requested Committee comment.
 - o Mr. Schingler commented that collaborating with the LAG, which meets every two months, would be beneficial.
- Mr. Klinger asked that before the meeting adjourns each group identify two or three top issues to focus on.
- A member of the Committee noted that he has the sense that industry still feels like what NOAA is doing is a black box. If NOAA could give industry a sense of confidence and trust that their tiering will remain current (it) will go a long way to alleviate the concerns (that) industry may have. That may be a continuing dialog or more information on the website. Sense in industry that the (tiering) process feels like a ‘black box’ and there are concerns whether NOAA can remain current.
 - o Dr. Brothers asked what information can CRSRA provide to help establish that trust. Can The Committee provide specific suggestions?
 - o Mr. Pomfret responded that industry is looking for assurance that CRSRA will continue to work in a way that will keep up with the market change.
 - o Mr. Schingler noted this is a question of governance and trust in a rapidly changing market. NOAA has adapted and is being clear and consistent. However, this was NOAA’s first foray into it, and there will be modifications over time. NOAA needs to be prepared to modify the governance structure.
 - o Mr. Pomfret emphasized that it would be good to see governance keep up with accepted practice.
 - o Mr. Lin used as an example NEI and how none of the existing benchmarks are relevant to NEI. NEI is about missions—docking or repair—not the capability of the camera.

Data Availability Task Group Report Out

David Langan

- Mr. Langan caveated his presentation by saying that the working group had not yet reached consensus. He reviewed the relevant definitions from 15 CFR Part 960, such as application categorization, unenhanced data, availability, and substantially the same. He stated that there is room to interpret some of these terms.
 - o He reviewed the regulatory definitions of remote sensing and available. He indicated that availability of the data as defined is different from Kyl-Bingaman availability and could mean available to the operator. Dr. Brothers interjected that, as defined and explained in the regulation’s preamble, availability equates to the Kyl-Bingaman standard and originates from U.S. export control law.
- Mr. Langan walked through data output from electro-optical sensors, gravimeters, and radar and asked what constituted “unenhanced data” for each of these. He also raised availability problems around NEI and dual-use systems, including how to determine availability when the product is a service and not data, and how to determine what data are available from a dual-use system.
- Mr. Langan listed possible recommendations for the Committee to consider, including:
 - o consider eliminating persistence or revisit rate from the data availability analysis, or use aggregated constellations as the benchmark;
 - o treat foreign dual-use systems as commercial systems, thus erring on side of U.S. industry; and
 - o assess foreign capabilities via the same technical analysis applied to licensed U.S. systems.
- Mr. Klinger asked for the working group to come to consensus on its key issues before the meeting’s end.

SAR Task Group Report Out

David Germroth

- Mr. Germroth reviewed the working group mandate and topics of discussion.

- o The group has several carryover recommendations from its prior work, including USG support of the U.S. commercial SAR industry.
- o The group believes global competition, and the struggle of the U.S. industry to compete, is a major topic. Subtopics include addressing traditional and virtual constellation capabilities and realistic next generation capabilities.
- o The group highlighted persistent imaging and how current regulations cause U.S. providers to struggle when competing against European constellations aggregated from multiple countries' assets.
- o Resolution is a primary concern for the working group. Mr. Germroth stated that there is a need for standardizing resolution measurements for comparison between systems.
 - He highlighted that SAR is more of a measurement system than an imaging system, and that it provides distances in X, Y, and Z axes, which is why phase data are so controversial. He pointed out that if you just use ground resolution, you're not getting the whole picture.
 - (He also stated) that there are 3 international companies providing 0.25 meter (m) azimuth and 0.5 m range resolution. NOAA has characterized these as 1 m systems, which isn't accurate.
 - SAR also has radiometric resolution, which describes the ability of an imaging system to discriminate between varying levels of energy.
 - Mr. Germroth repeated that SAR is a measurement system first and an Earth imaging system second and that all the parameters together are important.
- o Mr. Germroth also raised the noise equivalent sigma zero (NESZ) as an issue because it needs to be characterized for the type of image, such as spotlight, stripmap, etc. The type of image gives different information.
- With respect to dual-use systems, Mr. Germroth noted that Italian and German SAR systems are providing high resolution. The Italian system is controlled by the Italian military, and therefore there is tight state control over the data products allowed to be commercialized. The German system is a public-private partnership built by the German space agency.
- Mr. Klinger asked for the working group to come to consensus on its key issues before the meeting's end.

Futures Task Group Report Out

Bhavya Lal

- Mr. Lin reviewed the group's role to look at commercial space activities in the near-, mid-, and long-term, and how these activities might have bearing on NOAA's regulatory activities.
- The group identified 9 merging activities and evaluated which may pose a regulatory gap for NOAA. They quadrant of the activities' relationship to NOAA regulation, including those with no existing regulatory framework, those that might be covered by NOAA, those clearly covered by NOAA, and those covered by other USG agencies. The presentation included the reasons why each of these activities may fall into the different quadrants
 - o No activities identified would be clearly regulated by NOAA.
 - o Space-based solar power, cislunar position, navigation, and timing (PNT), and space nuclear propulsion do not have existing regulatory frameworks.
 - o NOAA's regulations could be stretched to cover expanded NEI activities, space structures and assembly in space, and active debris removal or salvage.
 - o Scientific data collection and commercial PNT are regulated by other agencies.
- Dr. Morin noted that there's a sense that there's a window in which the regulations can be stretched using the existing regulatory framework. Over time, the more the framework is stretched to accommodate new activities, the stranger the framework will grow. Thinking 5 to 10 years down the road, you have to ask if the regulatory framework will provide the level of authorization that would be acceptable from the USG perspective.
- Mr. Glenn Tallia, Section Chief, Weather, Satellites, and Research Section, Office of the General Counsel, NOAA, noted that jurisdiction is a big issue. NOAA's scope of authorization is provided to NOAA in statute. For each of the issues raised by the working group, the jurisdiction is factually specific. To determine that

jurisdiction, NOAA looks at the definitions in regulations and matches those with what people are doing. NOAA takes jurisdiction very seriously and gives it deep consideration.

Committee Discussion & Public Comments

- Mr. Klinger circled back to earlier working groups to ask for their top 2 or 3 topics.
 - Mr. Langan stated that their top question is answering the basic question of determining availability, especially with respect to dual-use systems. Beyond that, the working group will attempt to make a determination of data availability where there are discrepancies between industry thought and CRSRA's information in the benchmark guide.
 - Mr. Germroth said that the group will consider the 4 issues in the presentation: global competition, resolution, persistence, and signal-to-noise. The working group will be developing a standard understanding used to evaluate these. Mr. Langan was of the opinion that the group should drop NESZ as it relates to competition overseas, but the working group will keep it for now.
- Mr. Klinger wondered if there is any value in considering a regulatory framework in which much of the responsibility falls on the user, as it does in driving, alcohol, and security classification. He wondered if the regulation of phenomenologies of increasing complexity or for which the value results from the interaction of multiple parameters should be framed differently, and would the regulation be more user-focused.
- Ms. Dawkins then stated that CRSRA does not know what the capabilities of virtual constellations are but is trying to understand those capabilities and how they might influence tiering. CRSRA invited Ursa Space Systems to talk about what their capabilities and missions are and to help address some of the working group questions.
- Ms. Dawkins called on Ms. Julie Baker, Co-founder and Chief Operating Officer, Ursa Space Systems, to talk about virtual constellations.
 - Ursa has had to use many foreign providers to assemble their virtual constellation because the U.S. has no commercial SAR.
 - Every company has a different format and a different way of ordering or tasking images. Ursa's role is to make it easier for the consumer to get an analytic result than to go through multiple, disparate foreign providers. Ordering through Ursa also provides a level of anonymity and security.
 - At the moment, Ursa has approximately 18 different satellites sensing in different bands and at different resolutions. Ursa fully appreciates the complex nature of the different parameters defined in the SAR working group report out. Every operator has a different way of representing their metadata, down to using different terms for those parameters. Part of Ursa's job is to understand those differences.
 - Ursa has access to many different sensing modes.
 - Ursa has heard from U.S. providers that it sounds like the USG does not permit SAR companies to provide information within the 2 hours after data are acquired. Ursa is asked to provide data as fast as possible, but there's a limit to how fast observations can be acquired and processed for delivery.
- Ms. Dawkins asked what Ursa is advertising as the best possible revisit rate it can get with its systems, and does the company provide unenhanced or enhanced data.
 - Ms. Baker replied that most of the satellites are in sun-synchronous orbit. Over the polar regions, the virtual constellation can acquire observations approximately every 30 minutes. Over the mid-latitudes, the virtual constellation has a several hour revisit time. There is an upward limit on the area that can be covered daily.
 - Dr. Brothers asked if the data being provided to customers is of uniform spatial resolution and quality. Ms. Baker replied that it depends heavily on the resolution and area size the customer is trying to cover, and that part of Ursa's job is to determine what information the customer needs and what is possible in terms of coverage. Higher resolutions yield smaller footprints and vice versa. She said there are differences in the products between vendors, and Ursa doesn't generally receive "raw" data—it has already been processed to an extent.

- Ms. Baker noted that Ursa primarily provides analytics, not imagery.
- Mr. Germroth asked what Ursa would consider “raw” data. Ms. Baker responded that the company would not get data as it comes off of the sensor, although they do receive some phase history data. Ursa receives most products at the single-look complex level or more processed. Mr. Germroth noted that every country has some measure in place to limit phase history data. He asked if Ursa conducted direct tasking. Ms. Baker said Ursa does tasking but does not have direct satellite access.
- Mr. Schingler pointed out that data interoperability is an ongoing trend. There has been lots of work on the electro-optical side with the USG and globally with respect to standards. It is desirable to acquire data and put it into an analytics-ready format. There could be a role for NIST or NASA to look at data architectures and common data formats to make the data easier to handle downstream. This is what the 2020s will be about.
- Mr. Payam Banazadeh, member of the Committee, suggested that NOAA look at revisit in aggregated constellations. Mr. Langan agreed that by aggregating data from multiple vendors, you can reduce the revisit period to something unobtainable by a single vendor.
- Dr. Brothers returned to the ideas of interoperability and data standardization, asking Ms. Baker if the operator product is passed along or if Ursa standardizes the data that are passed along. Ms. Baker replied that, for most of Ursa’s products the company does not pass along the imagery that they are using for analytics. Some customers and particularly those in the USG, she said, want the source imagery for validation and verification. Also, they can share these images with coalition partners. When Ursa does provide the imagery, however, it translates the images into a single format.
- Mr. Klinger proposed an addition to the regulatory framework that would regulate applications or uses of the services or data the operator could sell.
 - Mr. Schingler asked what the benefit would be.
 - Mr. Klinger replied that this wouldn’t be a case-by-case review, but a ground-ruling out of certain classes of prospective users or applications of the data, and Mr. Schingler clarified that there would be a “free market” tier and tier with restricted applications and uses. Mr. Klinger concurred and stated that at the moment, regulation relies on restricting what the operator can provide, but perhaps a 4th tier would add clarity and risk-management to prevent unauthorized use.
 - Dr. Brothers asked if this would propagate downstream to data resellers and analytics firms, which are not under NOAA’s jurisdiction, and Mr. Klinger agreed that it probably would. He highlighted that the remote sensing industry is heading in a direction completely opposite from one in which the risk calculus can be based on the data themselves. It’s not the data, but the value-added services that are becoming the danger. This raises the point, again, of the Land Remote Sensing Policy Act being unable to govern the market remote sensing has become.
 - Mr. Tallia contributed that it sounds like a new statute would need a different approach because the current approach doesn’t regulate the products or downstream services. The concept is complicated by the First Amendment because much of remote sensing products are considered free speech. The First Amendment exists to prevent limitations on people’s access to information and how they use it.
 - Ms. Dawkins pointed out that in the past, the closest CRSRA has been able to get to this is limiting some data just for the use of USG. Any company can ask to sell any data, and it will be reviewed on a case-by-case basis. Using the example of the release of global position system location data, Mr. Klinger replied that not taking the long view in this matter can lead to unintended consequences that cause lasting harm. Mr. Schingler agreed.
- Mr. Klinger asked if the working groups are satisfied with their questions and asked that they come back by the next meeting with fleshed-out frameworks to address those questions.
 - Implementation: Working Group 1 (Kevin’s group)

- Identify ways that NOAA can stay current given the rate of change in the commercial environment, and what mechanisms NOAA could implement in its processes to ensure adaptability.
- o Data availability: Working Group 2 (Bhavya's group)
 - How to determine data availability from dual-use systems.
 - Identify data availability where there are discrepancies between industry opinion and the published CRSRA benchmark (the regulatory framework).
- o SAR: Working Group 3 (David's group)
 - How do we define global competition / markets in the area of SAR?
 - How do we define and think about persistence in SAR technology?
 - How do we define and think about resolution and signal to noise ratio as meaningful metrics for SAR regulation?
- Ms. Dawkins requested for Mr. Tallia to speak about what NOAA is doing to keep industry competitive.
 - o Mr. Tallia stated that he had heard it implied by the Committee that the regulatory regime is designed to keep U.S. companies at the level of foreign competition. He argued that the new regulations allow the U.S. to exceed foreign competition (Tier 2 or 3). Under the previous regime a company could be subject to regulations on any aspect of their system in perpetuity. Under the new rule, there is a 1-year limit on additional conditions for Tier 3 systems, and NOAA is committed to working with industry to see if there is a way to lessen conditions. Tier 2 systems have no temporary conditions and exceed foreign capabilities.
- Mr. Klinger then finished the subgroup review by stating the questions for ACCRES Working Group 4, the Futures group;
 - o How do we raise awareness about the future in general? (of new industry or policy developments)
 - o Look at the regulatory implications of different issues (that were previously briefed) and whether NOAA has jurisdiction over these issues?
 - o What are the changes to the regulatory framework (needed) in light of these trends coming down the road (such as various disruptive technologies) including jurisdictional boundaries?
 - o Mr. Klinger then thanked the Working Groups for their work to-date.
- Ms. Dawkins noted that right now both the implementation and data availability groups are looking at the same NEI issues. It would be helpful to CRSRA if the data availability group looked at how NEI data and services compare to those available from foreign sources on a global scale, whereas implementation would look at what constitutes mission assurance for NEI and what doesn't. There are sensitivities with NEI data, and that it will be regulated for at least the next year. CRSRA also needs assistance defining mission assurance and what examples there are. CRSRA is being told that companies are conducting mission assurance but is discovering that mission assurance isn't really the primary goal or activity. These questions take a lot of time because they come up daily.
- Mr. Klinger said that it is the role of DOD to determine what parts of NEI are security issues in the changing space environment, just as it is incumbent on industry to define specifically what it wants to use NEI for.
 - o Mr. Schingler raised the point that as space activities diversify, the Department of Commerce should consider that the different activities need to be regulated by the experts suited to regulate them. NEI is an example of this.
 - o Mr. Klinger proposed establishing a Futures subgroup focused on NEI that can cut across the different working group topics. The Committee concurred.
 - o Mr. Herzfeld asked if, as NEI is a relatively new issue, Mr. Tallia could share if there has been a jurisdiction analysis concerning it. Mr. Tallia replied that NEI was considered in writing the regulation. Mr. Germroth stated that he remains unconvinced that the regulations encourage industry leadership. Mr. Tallia pointed out that if every system were a Tier 2, that would mean the U.S. had cornered the market in a sector. That would be the most desirable outcome.

- o Mr. Lin pointed out that there appears to be a loophole in the temporary nature of the Tier 3 conditions because there is no clarity on when the 1-year clock starts. This really means that the period is greater than 1 year. Ms. Dawkins replied that for those licensees existing before the new regulations, the clock started on July 20, 2020. She also clarified again that the temporary conditions only apply to the capability that put the company in the Tier 3 category, nor is it guaranteed that a Tier 3 license will receive any additional conditions. USG wants all licensees to be Tier 2.
- o Mr. Klinger emphasized that businesses don't like regulatory "maybe" because venture capitalists (investors) really don't like regulatory "maybe." The government underappreciates the degree to which regulatory uncertainty or uncertainty in a company's ability to sell its product, is a bad thing. Any ambiguity is not a good thing for the industry.
- Ms. Dawkins then clarified that, regarding making data available, Tier 1 and Tier 2 systems have no restrictions. Tier 3 systems could feasibly receive a hold on dissemination the data they collect.
- A member of the audience asked if having a NASA Technology Transfer technology could cause a sensor to be considered for Tier 2? Ms. Dawkins replied that the company would need to fill out an initial contact form because CRSRA requires the details of the mission to determine if a license would even be required. Tiering would be based on the data to be made available, and she suggested looking at the benchmarks.

Closing Remarks

Gil Klinger

- Mr. Klinger closed by urging the working groups to buckle down on their defined tasks. He added that agencies are looking for lists of the greatest concerns and prominent issues to be addressed over the next 4 years and encouraged that ACCRES consider what those issues within the Committee's jurisdiction would be.
- Mr. Klinger thanked the Committee, CRSRA staff, and audience, and Ms. Dawkins adjourned the meeting.

Meeting Adjourned, 1:30 pm EDT

Tahara Dawkins